fails in the question of morale, for when young scientific workers see that however attractive may be the places of the men at the top, the chances for any individual are that he will become only a part of an efficient machine, then a man of ambition will choose some machine where the material rewards are greater than in science.

One great disadvantage in the arrangement of separating the observer and the computer is that a realization of attainable accuracy is likely to be lost. It sometimes seems that the farther the computer is removed in time and place from the original observations, the greater is the accuracy which these observations take on. A good illustration is in some modern computations of results based upon old observations of variable stars. The method of Argelander, of simply looking first at one star and then at another, and estimating the difference of brightness, is still of the utmost value, but errors as great as ten or twenty per cent, in the ratio of the light of two stars are not uncommon. We can make the accuracy seem greater by expressing the estimate in stellar magnitude, when the errors are only one or two tenths of a magnitude, but the fact remains that the discordances are a large fraction of the quantities sought. Some computers taking results of such estimates have managed to derive elements of variable stars where some of the derived quantities are expressed to five significant figures, although the original data were often wrong in the second figure. This fictitious accuracy seems to come from a state of mind where the more you compute the more figures you get, and the investigator needs the restraining influence of experience in securing observational data. Of course, the computer, if he goes about it in the right way, can really show the observer just how accurate the measures are, but in his anxiety to establish some fine theory the computer sometimes loses his own sense of proportion.

And so it goes; the observer does not know how to observe unless he realizes the value of experiment; the experimenter loses a great deal if he has not acquired the technique of observation; neither the experimenter nor the observer can work to the best advantage unless he has the proper theoretical background; and the pure theorist may be saved from various grotesque mistakes if he becomes acquainted with some of the methods and difficulties of securing the facts of physical science.

We may, therefore, best dwell not on the differences among experimenters, observers, and theorists, but rather on their strength when united and working together. No matter how well rounded an individual may become, his capabilities may be easily surpassed by a group of cooperating workers. If it be objected that new ideas will not originate in a committee, the answer is that any one of us has plenty of ideas, many of them fundamental and important, but what we lack is the ability and power to put our ideas into execution. It is here that to my mind lies the great advantage of the policy of the National Research Council in bringing together in committee workers from all over the country so that they can form plans of joint attack on various problems. In our universities and other institutions there is great opportunity for cooperative effort between colleagues, but even in the same institution or department the interests may be so divergent that a worker may find little help of just the kind that he needs, whereas in some other parts of the country may be one or more competitors who, if they can be got together to talk things over, will turn out to be only hearty collaborators.

Astronomy is called the oldest of the sciences; our friends in other fields say that it has been in the lead in America, and especially that astronomers were the first to organize cooperation in research. Let us not fail to continue to deserve this good name, and to set the example in so far as we can of free trade and mutual good will in the solving of our problems.

JOEL STEBBINS
UNIVERSITY OF ILLINOIS OBSERVATORY

GENERAL FEATURES OF THE TORONTO MEETING

THE second Toronto meeting of the American Association for the Advancement of Science and of the associated scientific societies,

which was held during the last week of the year just ended, was the seventy-fourth meeting of the association. It was successful in every way and must go on record as the most satisfactory meeting thus far held, aside from the greater, four-yearly meetings. Some of these greater meetings—as the last Chicago meeting, for example—have surpassed it in the number of those in attendance, and in the number of societies meeting with the association, but it is safe to say that the second Toronto meeting was at least equal to any previous meeting in other respects. Fourteen sections of the association were represented, and twenty-six associated societies. The general program,[1] of 95 pages, showed the programs of all sections and societies. About nine hundred addresses and contributed papers were presented, representing nearly all branches of science. If these were printed together they would make four large volumes.

The total number of those in attendance was 1,832, geographically distributed as shown below:

SUMMARY:	
United States, including Hawaii and the Philippine Islands	867
Canada	953
England, Belgium and Japan	12
Total	1,832
BY REGIONS:	
City of Toronto	686
Ontario outside of Toronto	186
Quebec	34
New Brunswick, Nova Scotia and Prince Edward Island	15
New York State	199
Maine, Vermont, New Hampshire and Rhode Island	34
Massachusetts	48
Connecticut	19
Pennsylvania	68
New Jersey	28
District of Columbia	57
West Virginia, Virginia, Delaware and Maryland	39
Ohio	59
Michigan	48
Indiana, Kentucky and Tennessee	34
Wisconsin	30
Illinois	77
Minnesota, Iowa and Missouri	54
North Dakota, South Dakota, Nebraska and Kansas	19
Saskatchewan and Manitoba	22
Montana, Wyoming and Colorado	13
British Columbia and Alberta	10
Washington, Oregon, California, Idaho, Nevada and Utah	11
North Carolina, South Carolina, Georgia, Florida, Alabama, Mississippi, Louisiana and Arkansas	16
Arizona, New Mexico, Texas and Oklahoma	12
England	5
Belgium	3
Hawaii	1
Philippine Islands	1
Japan	4

[1] Fifteen hundred copies of the general program were printed, but this number proved to be inadequate, and many of those who registered late in the meeting did not receive copies. A few copies are now available in the permanent secretary's Washington office, and these may be had by members on request, as long as the supply lasts.

On the afternoon of Monday, December 26, the day before the official opening, the secretaries of the sections met with the general secretary and the permanent secretary to discuss some of the general problems of the association. They dined together and continued their conference in the evening. On Tuesday afternoon Dr. F. R. Moulton, professor of astronomy in the University of Chicago, showed some very fine motion pictures on scientific subjects, illustrating the use of motion pictures in education. The films were furnished by the Society for Visual Education of Chicago.

This meeting of the association and the associated societies was held in Toronto on invitation of the University of Toronto and of the Royal Canadian Institute. The sessions were held in the buildings of the university, which are excellently adapted for such purposes, while the majority of those in attendance were very conveniently housed in the university dormitories. Meals were served in the university dining halls. These arrangements proved to be unusually convenient and satisfactory for all, and especially for those

who roomed at the university. For these there was comparatively little need for going back and forth between the university grounds and the down-town section of the city. The hospitality of the University of Toronto and of the Toronto friends of science was greatly appreciated.

The meeting was formally opened on the evening of Tuesday, December 27, in Convocation Hall, the University of Toronto, under the able presidency of Dr. E. H. Moore, professor of mathematics in the University of Chicago, who was introduced by the retiring president, Dr. L. O. Howard, chief of the Bureau of Entomology of the U. S. Department of Agriculture, who was permanent secretary of the association for many years. Sir Robert Falconer, president of the university, delivered an admirable address of welcome, calling attention especially to the close and friendly relations that have so long obtained between Canada and the United States. This was followed by the address of the retiring president. Among many other interesting things, Dr. Howard called attention to the fact that the average age of the presidents of the British and of the American Association since 1895 is about the same—61 years and 11 months for the British and 61 years and 5 months for the American. The second part of Dr. Howard's address dealt with the topic, The War against the Insects. He considered the unceasing warfare that must be waged by mankind against the almost countless and omnipresent forms of insect life which threaten the very existence of the human race. Dr. Howard's address has been printed in full in SCIENCE, for December 30, 1921. The opening sessions were followed by a reception in the room behind Convocation Hall, where members and their friends had opportunity to meet one another and to examine the exhibits of scientific apparatus and products brought together under the auspices of the association for this meeting.

On Wednesday afternoon many members of the association and their friends visited the Royal Ontario Museum, on special invitation, and enjoyed the opportunity of seeing the exceptionally fine collections of the museum.

The Wednesday evening session, in Convocation Hall, was of a twofold character. Professor William Bateson, director of the John Innes Horticultural Institution, Merton Park, Surrey, England, who was present at Toronto by joint invitation of the American Association and the American Society of Zoologists, delivered a stimulating address on "Evolutionary Faith and Modern Doubts." He clearly emphasized the point that students of evolution harbor no doubts as to the *fact* of evolution, but the exact *mode* of evolution remains still an unsolved problem. Professor Bateson's address will be printed in SCIENCE.

At the close of this address the session was transformed into a convocation of the University of Toronto, Sir Robert Falconer presiding, at which the degree of Doctor of Science *honoris causa* was conferred on Professor Bateson, Retiring President Howard and President Moore. A reception followed the convocation.

Sir Adam Beck, chairman of the Hydro-Electric Commission of Ontario, addressed a general session, on Thursday afternoon, under the auspices of Section M (Engineering). His subject was "Hydro-Electric Developments in Ontario." After pointing out how these developments have been due to the men of pure science, as well as to those of applied science—the electric and the hydraulic engineers—Sir Adam traced briefly the history of the hydro-electric enterprises of Ontario, showing how the commission is able to deliver electric power from Niagara Falls in Windsor (254 miles away) at a price only about one third as great as that of steam-generated electricity in Detroit, across the river. Electricity for the common home is supplied at minimum cost. Sir Adam showed a series of moving pictures, illustrating the various hydro-electric projects in Ontario.

The Thursday evening conversazione in Hart House was one of the greatest social functions ever held in Toronto and was unique in the history of the association. For three hours the two thousand guests of the university and the Royal Canadian Institute enjoyed the entertainment facilities of the magnificent students' social center in Queen's Park. The

theater beneath the quadrangle of the big building was filled three times during the evening; Mr. J. Campbell McInnis rendered three very fine song programs, Irish, Scotch and English. The string quartette in the music room was a center of attraction. The band of the 48th Highlanders played near the Great Hall, and the pipers promenaded the corridors. An exhibition in the sketch room attracted those interested in art and architecture. Many athletic features were enjoyed, including water polo in the natatorium, indoor base-ball, basket ball, squash in the squash courts, boxing, wrestling and fencing. Supper was served in the Great Hall, in the dining hall of the Faculty Union and in the Graduate Commons. The conversazione will be long remembered by all who were present; it not only furnished entertainment and a very pleasant social evening, but it also provided opportunity to renew friendships and to form new ones and to exchange views regarding the work and plans of those in attendance.

To give visitors a sample of Canadian winter sports, "A Half Hour with the Toronto Skating Club" was provided on Friday afternoon, in the Arena, with artificial ice. An exhibition of artistic figure-skating was followed by a hockey match between the Varsity Intermediates and the St. Helen's Intermediates.

A most interesting showing of scientific apparatus and products was open throughout the meeting, in the room behind Convocation Hall. The arrangements for this exhibition were in charge of the Subcommittee on Exhibits, of which Professor E. F. Burton was chairman, and the work of the subcommittee was greatly appreciated. A British firm exhibited various articles of fused silica ("vitreosil"), exceedingly resistant to acids and alkalis and capable of withstanding very high temperatures and rapid temperature changes. Dr. MacKenzie's ink polygraph, which makes simultaneous tracings of the beats of the pulse, heart and jugular vein, was among the instruments shown. There was an interesting exhibit of the action of Stoechel's tube. A collection of books showing the extension courses given by the University of Toronto, and another on the question of an international auxiliary language were interesting parts of the exhibition.

A collection of Canadian paintings was on exhibition during the meeting, under the auspices of the Royal Canadian Academy, in the Art Gallery of Toronto. A collection of fine water-color paintings of mountain and glacier subjects, the work of Professor A. P. Coleman, formed a part of the exhibition in the Convocation Hall building; also an extraordinary collection of artistic photographs, exhibited by the Toronto Camera Club.

A women's reception room was maintained throughout the meeting, in the library building, and tea was served here every afternoon.

The Toronto meeting was especially international in character. It emphasized the point that the American Association is an international organization. Although the majority of its members are residents of the United States, it was clearly visualized at Toronto how much the future of the association depends upon Canadians. The meeting was an occasion for a pronounced increase in the Canadian membership, and it is hoped that the time will soon come when Canadian scientists will all regard the association as theirs. A wonderfully fine spirit of international good-fellowship and understanding prevailed throughout the second Toronto meeting and hovered benignly over the multitudinous and varied sessions.

The weather throughout the meeting was fine indeed—cold enough to be stimulating and with almost unclouded sky. The use of artificial ice for winter sports in Toronto furnished an agreeable surprise to those who had anticipated arctic cold.

Many well-attended dinners were held during the meeting, by the various groups of scientists. A list of these follows: (1) For mathematicians, physicists and astronomers; (2) for geologists and engineers; (3) for zoologists; (4) for entomologists; (5) for naturalists; (6) for ecologists; (7) for botanists; (8) for phytopathologists; (9) for psychologists; (10) for agriculturists; (11) for foresters; (12) the annual metric dinner; (13) the Sigma Xi dinner; (14) the Gamma Alpha dinner; (15) the Phi Kappa Phi dinner. Besides these, there was the biological smoker. An important feature of the meeting was the

Women's Dinner, held in the Great Hall of Hart House on Friday evening. Those attending dinners held in the university buildings on Friday evening enjoyed several entertaining surprise features introduced by the Local Committee, including selections by the bagpipers and the choristers, and several other musical numbers. At most of the dinners toasts were proposed and responded to, with many inspiring after-dinner speeches.

The programs of the sections and of the societies associated with them were generally extensive, and all were interesting and important. The vice-presidential and presidential addresses will be noted in a later issue of SCIENCE, as will also the various symposia of these programs. Special mention should be made here of the program of Section M (Engineering) (which presented no program at the recent Chicago meeting), and of the symposium on "An International Auxiliary Language," which was arranged for Toronto under the auspices of Section K (Social and Economic Sciences).

The Engineering program was unusually excellent in many ways. Arrangements for this were due to the very efficient work of Mr. J. B. Tyrrell, of Toronto, vice-president of Section M. The Society for the Promotion of Engineering Education met with the section. The engineering program began on Tuesday forenoon, with an address on the "Natural Resources of Canada" by the Honorable Sir Clifford Sifton, K.C.M.G., etc., formerly minister of the interior, and head of the Conservation Commission of the Dominion of Canada. The program continued through Thursday afternoon, with two sessions each day, many of the papers being illustrated by motion pictures. It was concluded by Sir Adam Beck's address on "Hydro-Electric Developments in Ontario," given at the Thursday afternoon general session of the association as a whole, the engineering section furnishing this important feature of the general sessions. The two engineering sessions on Friday were under the auspices of the Society for the Promotion of Engineering Education. A very enjoyable dinner of engineers and geologists was held in the Music Room of Hart House on Friday evening, at which a number of inspiring speakers were heard. The president of the university and the general secretary and the permanent secretary of the association were among the guests.

The social and economic sciences (Section K) had no separate program at the Toronto meeting, but a new symposium topic of very broad interest was introduced under the auspices of this section. Through the enthusiastic and efficient work of Dr. F. G. Cottrell, of the U. S. National Research Council, this symposium was arranged, on "An International Auxiliary Language." It was held at a joint session on Friday afternoon, of Sections K and Q (Education). The symposium was preceded by the delivery of the address of the retiring vice-president of Section K, Dr. Frederick L. Hoffman, of the Prudential Life Insurance Company of America, on "The Organization of Knowledge." Dr. Hoffman emphasized the imperative need for better methods in the classification of knowledge, so that what science has already accomplished may become much more easily available. He presented an improved scheme of classification that promises to be very valuable in this important and fundamental field of scientific endeavor. Related to Section K was the program of the American Metric Association, which held two sessions on Thursday and a dinner on Thursday evening, with papers and addresses favoring the more general use of the metric system of weights and measures.

A program of great general and cultural interest was presented by the Committee on the History of Science, in a session held on Thursday forenoon. Among others, Dr. J. Playfair McMurrich—afterwards elected president of the association for 1922—gave a paper on the artistic-anatomical work of Leonardo da Vinci.

Chemical science (Section C) was unusually well represented at the Toronto meeting. Section C took part in four joint sessions with other sections and associated societies, including the Canadian Institute of Chemistry and the Toronto Section of the Society of Chemical Industry. A symposium on the Quantum Theory and a joint session with the Physio-

logical Section of the Botanical Society of America were of special importance.

Section N (Medical Sciences) presented a symposium on "The Health and Development of the Child." The successful efforts of Dr. A. J. Goldfarb, of the College of the City of New York, secretary of Section N for the Toronto meeting, in arranging this program were greatly appreciated.

The extraordinary success of the meeting was due mainly to the tireless and varied activities of the members of the Local Committee for the second Toronto meeting, who foresaw all needed arrangements and added many pleasant and convenient extras. Most of the general arrangements were practically complete at the time of the general and permanent secretaries' preliminary visit to Toronto (November 21-23), and the three following weeks were occupied in working out the manifold details. The permanent secretary wishes to emphasize the efficient and cordial spirit of cooperation and help with which the members of the Local Committee responded to all requests and inquiries from Washington during the somewhat hectic weeks just before the meeting.

The Local Committee consisted of the following members: J. C. Fields, *Chairman;* F. A. Mouré, *Hon.-Treasurer;* H. L. Seymour, *Secretary;* the Honorable Henry Cockshutt, Lieutenant-Governor of Ontario; J. W. Bain; E. W. Banting; S. G. Bennett; E. A. Bott; G. S. Brett; E. F. Burton; J. R. Cockburn; the Honorable Manning Doherty; D. A. Dunlap; Sir Robert Falconer, President of the University of Toronto; Lady Falconer; Sir Joseph Flavelle; A. E. Gooderham; the Honorable R. H. Grant; A. Hunter; A. G. Huntsman; H. V. F. Jones; A. D. LePan; J. J. MacKenzie; J. C. McLennan; J. P. McMurrich; W. L. Miller; C. H. Mitchell; J. M. D. Olmsted; Sir Edmund Osler; I. R. Pounder; Sir Clifford Sifton; Sir Edmund Walker; C. H. C. Wright. The Local Subcommittees, with their respective chairmen, were as follows: Hospitality, Sir Robert Falconer; Entertainment and Dinners, I. R. Pounder; Ladies, Lady Falconer; The Hart House Conversazione, S. G. Bennett; Dormitories, J. M. D. Olmsted; Hotels, G. S. Brett; Transportation and Reception, C. H. C. Wright; Meeting Places, E. A. Bott; Exhibits, E. F. Burton; Signs and Messenger Service, E. W. Banting; General Program and Other Printing, J. P. McMurrich; Publicity, A. G. Huntsman; Membership, H. V. F. Jones; Registration Room, J. R. Cockburn.

Dr. Fields and Mr. Seymour are to be thanked for their indefatigable attention to all details, which made the meeting so exceptional. Especially was the very artistic official badge praised. It is a metal button with a narrow raised margin and the design in relief. The design consists of the figure of a beaver with a wreath of maple leaves, and the words "Toronto, A. A. A. S., 1921." This badge will serve as a worthy commemoration of one of the most satisfactory meetings of the association.

All those present keenly appreciated the kindness, efficiency and facility with which Sir Robert Falconer and Lady Falconer represented the University of Toronto, and they received the thanks of all for their personal hospitality as well as for that of the university. Visitors could not avoid noticing how much the university staff had put themselves out (frequently in the literal as well as in the figurative sense) so that the rooms might be available for the scientific sessions, and so forth. It is no inconsiderable inconvenience to a university staff to have their rooms occupied by others during practically the whole of the holiday vacation, and the hearty thanks of the association are due to the members of the University of Toronto.

As chairman of the subcommittee on Exhibits, Professor E. F. Burton did a great service to the association and to the cause of science; so satisfactory was the Toronto exhibition that it is hoped an exhibition of scientific apparatus may become a regular part of the annual meetings.

The very onerous and pressing work of caring for the publication of the general program was done by Dr. J. P. McMurrich, who handled this very difficult and confusing complex of details with great skill. It should be noted that the entire program—a book of 95

pages—had to be printed in a single week from the time the first batches of manuscript were received by Dr. McMurrich. Indeed, most of the program manuscripts did not reach him till December 20 and 21, and the book was completed by noon on December 24. The University of Toronto Press gave very efficient and really wonderful service in this connection.

The registration room, in charge of the executive assistant, Mr. Sam Woodley, was conveniently and centrally located, in the library building of the university. An able corps of assistants was provided, and the work of the registration office went forward with exceptional smoothness. The same form of visible directory as was used at the last annual meeting was employed at Toronto, and this again proved to be a valuable feature of the meeting. By this plan, a continuously corrected list of those in attendance, with their home addresses and those for the meeting, is kept convenient for public consultation in the registration room. The assistant secretary, Dr. Sam F. Trelease, assisted the permanent secretary in many ways, aside from his work as secretary of the council. He gave valuable service in the editing of the manuscripts for the general program before they were sent to Toronto be printed. He has also helped very much in the preparation of the present paper and the other reports of the meeting that are to be published in SCIENCE.

Publicity was unusually well handled at the Toronto meeting. As was announced in the preliminary announcement and also in SCIENCE before the meeting, the recently organized Science Service cooperated with the association in arousing public interest in the meeting, through the daily press. Dr. E. E. Slosson, editor of Science Service, and Mr. Watson Davis were present throughout the meeting, on behalf of the Science Service. Many of the papers occurring on the programs at Toronto were given attention in the weekly "Science News Bulletin" sent to newspapers by the Science Service for the week of the meeting, and many dailies received each day from the service a 500-word telegraphic report on the meeting.

Besides the valuable publicity work of the Science Service, which is under the control of the American Association, the U. S. National Academy and the U. S. National Research Council, and which operates for the sole purpose of disseminating scientific knowledge through the newspapers, just as valuable and efficient publicity work was accomplished by the Local Subcommittee on Publicity, of which Professor A. G. Huntsman was chairman. At Professor Huntsman's suggestion, a new feature was introduced this year by the permanent secretary's office. As the manuscripts for the general program came in during the week preceding Christmas day, the names of all speakers were copied off, after which the manuscripts were edited and forwarded to Toronto for printing. To each name occurring on each day's list was addressed a letter asking for an abstract of the paper to be given at Toronto by that individual, and enclosing a blank form for this abstract, to be returned to Professor Huntsman. This work had to be done with great rapidity, but large numbers of abstracts were received and these furnished material for the work of the Subcommittee on Publicity. It seems desirable to develop this feature of special personal requests for abstracts and to retain it for future annual meetings of the association. Professor Huntsman and his colleagues used the abstracts as they came in, so as to have representative and suitable material ready for the newspapers during the meeting, and they thus secured for the association unusually excellent and exceptionally satisfactory treatment by the daily press of Toronto and other cities.

A report of the proceedings of the Council at Toronto will appear in a later issue of SCIENCE.

BURTON E. LIVINGSTON,
Permanent Secretary.

CAROLINE BURLING THOMPSON
1869-1921

DR. CAROLINE BURLING THOMPSON, professor of zoology at Wellesley College, died on December 5, 1921. Professor Thompson was noted not only for the excellence and thoroughness of her original methods of teaching, but also